

# Exhibit A

# Brian Neil Levine

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## Professional Experience

- **University of Massachusetts, Amherst, MA**  
*Professor*, College of Information and Computer Sciences Sept. 2010–present  
*Director*, UMass Cybersecurity Institute  
*Associate Professor*, Department of Computer Science Sept. 2005–August 2010  
*Assistant Professor*, Department of Computer Science Sept. 1999–August 2005  
Research interests focus on security and networking; including topics within thwarting crimes against children, peer-to-peer networking, mobile systems, forensics, privacy, and disruption tolerant networks.
- **MIT Lincoln Laboratory**, Lexington, MA August 2020–May 2021  
*Visiting Scientist* (and consultant) in Cyber Operations & Analysis Technology (Group 57)
- **National Institute of Justice**, Washington, DC June 2020–February 2021  
*Consultant*, sole author of NIJ's report to Congress as required by the 2008 PROTECT Act.
- **Fiksu, Inc.**, Boston, MA June 2012–June 2013  
*Vice President, Research*: Real-time bidding advertisement networks; empirical analysis, optimization, and algorithmic design in the context of “big data” production system.
- **Intel Research**, Cambridge, UK July 2004  
*Visiting Researcher*. Topics: disruption-tolerant networking.
- **Sprint Advanced Technology Laboratories**, Burlingame, CA July–Aug. 2000  
*Consultant*. Topics: mirror servers on the Internet.
- **Sprint Advanced Technology Laboratories**, Burlingame, CA July–Aug. 1999  
*Consultant*. Topics: deployment of multicast on the Internet.
- **University of California — Santa Cruz, CA** Oct. 1994–June 1999  
*Research Assistant*. Topics: multicast-related protocols.
- **Institut National de Recherche en Informatique et en Automatique (INRIA)**, Sophia-Antipolis, France May–Aug. 1998  
*Research Intern*. RODEO project. Topics: large-scale multicast applications.
- **Lucent Technologies, Bell Laboratories**, Holmdel, NJ June–Sept. 1997  
*Research Intern*. Networking Software Research Department. Topics: IP multicast.
- **Sun Microsystems Laboratories**, Mountain View, CA June–Sept. 1996  
*Research Intern*. High-Speed Networking group. Topics: ATM-based reliable multicast.

## Education

- **Ph.D. in Computer Engineering**, June 1999  
University of California — Santa Cruz  
Dissertation: “Network Support for Group Communication”  
Advisor: Prof. J.J. Garcia-Luna-Aceves
- **M.S. in Computer Engineering**, June 1996  
University of California — Santa Cruz  
Master's Thesis: “A Comparison of Known Classes of Reliable Multicast Protocols”  
Advisor: Prof. J.J. Garcia-Luna-Aceves
- **B.S. in Applied Mathematics & Computer Science**, May 1994  
State University of New York at Albany  
Phi Beta Kappa; *magna cum laude*; Dean's List every semester  
Cumulative GPA 3.73/4.00  
New York State Regent's Scholarship (1990)

## **Fellowships and Awards**

- **2022 Baskin Engineering Distinguished Graduate Alumnus.** Awarded to one graduate alum each year by the University of California Santa Cruz Baskin School of Engineering based on professional achievements.
- **2020 ACM Fellow,** “*For contributions to network forensics, security, and privacy, and for thwarting crimes against children*”. The ACM Fellows program recognizes the top 1% of ACM Members for their outstanding accomplishments in computing and information technology and/or outstanding service to ACM and the larger computing community. Fellows are nominated by their peers, with nominations reviewed by a distinguished selection committee.
- **2017 IEEE Infocom Test of Time Award** for “MaxProp: Routing for Vehicle-Based Disruption-Tolerant Networks,” published in IEEE INFOCOM 2006. The IEEE INFOCOM Test of Time Paper Award recognizes papers published between 10 to 12 years ago in the INFOCOM Proc. that have been most cited and widely recognized to have a significant impact on the research community.
- **UMass Spotlight Scholar** (May 2016). Scholars are faculty who have demonstrated academic quality and leadership, nominated from tenure-track and non-tenure-track faculty on the Amherst campus.
- **Runner-up for Best Paper Award** at the 2013 International World Wide Web (WWW) Conference for “Measurement and Analysis of Child Pornography Trafficking on P2P Networks” (Hurley et al.); Out of 122 accepted papers (and 831 submissions).
- Co-advised Aruna Balasubramanian’s dissertation, which received the *Runner-up ACM SIGCOMM Doctoral Dissertation Runner-up award* in 2011. (Co-advisor: Arun Venkataramani)
- **2011 Outstanding Research Award,** College of Natural Sciences, UMass Amherst. Awarded in part for work in digital forensics and crimes against children. Presented each year to two faculty from across 16 departments.
- **2008 Alumni Award for Excellence in Science & Technology** from the University at Albany (SUNY).
- **2007 Outstanding Teacher Award,** College of Natural Sciences & Mathematics, UMass Amherst. Awarded in part for working with undergraduates in research, curriculum and course development, and classroom activities.
- **2004 Outstanding Paper award** at *ISOC Symposium on Network and Distributed System Security (NDSS)* for “An Analysis of the Degradation of Anonymous Protocols” (Wright, Adler, Levine, and Shields).
- **2003 Lilly Teaching Fellow.** Run by the UMass Center for Teaching (CFT), this competitive program is based on applicant’s student teaching evaluations and a project proposal. The yearlong program includes collaboration with the CFT on individual projects and discussions with other Fellows to share ideas and experiences related to teaching excellence at the college level.
- **2002 National Science Foundation Faculty Early Career Development (CAREER)** award recipient. This \$410,000 grant is a prestigious NSF award for new faculty members.

## **Keynotes and Select Invited Talks**

1. *Invited Talk*, “Shining Light on Internet-based Crimes Against Children,” USENIX Security Symposium, Santa Clara, CA, August 15, 2019.
2. *Keynote*, “Thwarting Internet-based Sexual Exploitation Crimes Against Children,” Yahoo Tech Pulse conference, Sunnyvale, CA, December 2015.
3. *Keynote*, “Fighting Internet-based Sexual Exploitation Crimes Against Children,” 6<sup>th</sup> International Systems and Storage Conference (SYSTOR), held in cooperation with USENIX and the Technion Center of Excellence (TCE). Haifa, Israel, June 2013.
4. *Keynote*, “Deployment of a Diverse, Outdoor Mobile Testbed,” ICST Workshop on Networking in Public Transportation. Waterloo, Canada, August 2006.

## **Publications**

### **Statistics**

According to Google (<http://scholar.google.com/citations?user=oHbIF48AAAAJ>) as of January 2022:

- 20,000+ citations total
- h-index of 53; and 44 papers with at least 100 citations each.

## Public Reports

- Brian Levine, “Report to Congress: Increasing the Efficacy of Investigations of Online Child Sexual Exploitation”. Forthcoming in 2022. On behalf of the National Institute of Justice, as required by the PROTECT Act of 2008. Roughly 90 pages not including references.

## Peer-Reviewed Journal Articles

1. Keen Sung, Joydeep Biswas, Erik Learned-Miller, Brian Levine, and Marc Liberatore. “Server-side traffic analysis reveals mobile location information over the Internet.” *IEEE Transactions on Mobile Computing*, Volume 18, Issue 6, June 2019. Pages 1407–1418. DOI: 10.1109/TMC.2018.2857777
2. George Bissias, Brian Levine, Marc Liberatore, and Swagatika Prusty, “Forensic Identification of Anonymous Sources in OneSwarm.” *IEEE Transactions on Dependable and Secure Computing*, Volume 14: Issue 6, Nov 2017. pages 620–632.
3. George D. Bissias, Brian N. Levine, Marc K. Liberatore, Brian Lynn, Juston Moore, Hanna Wallach, and Janis Wolak, “Characterization of Contact Offenders and Child Exploitation Material Trafficking on Five Peer-to-Peer Networks.” *Elsevier Child Abuse & Neglect*, 52:185–199, February 2016.
4. Marc Liberatore, Brian Levine, Clay Shields, and Brian Lynn, “Efficient Tagging of Remote Peers During Child Pornography Investigations.” *IEEE Transactions on Dependable and Secure Computing*, 11(5):425–439, September 2014.
5. Janis Wolak, Marc Liberatore, and Brian Levine, “Measuring a year of child pornography trafficking by U.S. computers on a peer-to-peer network”. *Child Abuse & Neglect*, 38(2):347–56. February 2014.
6. N. Boris Margolin, Brian Levine, James D. Miller, and Matthew Wright, “Economic incentives for protecting digital rights online.” *Electronic Commerce Research and Applications*. 10(5):553–564, September 2011.
7. Marc Liberatore, Bikas Gurung, Brian Levine, and Matthew Wright, “Empirical Tests of Anonymous Voice Over IP.” *Elsevier Journal of Computer Networks and Applications*. Journal of Network and Computer Applications. January 2011. 34(1):341–350.
8. Aruna Balasubramanian, Brian Levine, and Arun Venkataramani, “DTN Routing as a Resource Allocation Problem”. *IEEE/ACM Transactions on Networking (TON)*. April 2010. 18(2):596–609.
9. Nilanjan Banerjee, Mark D. Corner, and Brian Levine, “An Energy-Efficient Architecture for DTN Throwboxes.” *IEEE/ACM Transactions on Networking (TON)*. April 2010. 18(2):554–567.
10. Brendan Burns, Oliver Brock, and Brian Levine, “MORA Routing and Capacity Building in Disruption-Tolerant Networks”. *Elsevier Ad hoc Networks Journal*. 2008. 6(4):600–620. June 2008.
11. Matthew Wright, Micah Adler, Brian Levine, and Clay Shields. “Passive-Logging Attacks Against Anonymous Communications Systems”. *ACM Transactions on Information and System Security (TISSEC)*, 2008. 11(2). 34 pages. May 2008.
12. Jim Partan, Jim Kurose, and Brian Levine. “A Survey of Practical Issues in Underwater Networks “, *Special Issue of ACM Mobile Computing Communications Review* (selected papers from WUWNet 2007 that were further reviewed), 11(4):23–33. October 2007.
13. Nathaniel E. Baughman, Marc Liberatore, and Brian Levine, “Cheat-Proof Payout for Centralized and Distributed Online Games”. *IEEE/ACM Transactions on Networking (ToN)*. 15(1):1–13. February 2007.
14. Kimaya Sanzgiri, Daniel LaFlamme, Bridget Dahill, Brian Levine, Clay Shields, and Elizabeth Belding-Royer, “Authenticated Routing for Ad hoc Networks”. *IEEE/ACM Journal of Selected Areas in Communications. (JSAC) Special Issue on Wireless Ad hoc Networks*. 23(3):598–610. March 2005. (Acceptance rate: 31/159, 20%).
15. Jeffrey Arnold, Brian Levine, R. Manmatha, Francis Lee, Prashant Shenoy, M.-C. Tsai, T.K. Ibrahim, D. O’Brien, D.A. Walsh, “Information Sharing in Out-of-Hospital Disaster Response: The Future Role of Information Technology”. *Journal of Prehospital and Disaster Medicine*. 19(3):201–207. July–September 2004.
16. Matthew Wright, Micah Adler, Brian Levine, and Clay Shields, “Analysis of the Degradation of Anonymous Protocols”. *ACM Transactions on Information and Systems Security (TISSEC)*. 7(4):489–522. November 2004. (Submitted by invitation.)
17. Brian Levine and Clay Shields, “Hordes: A Protocol for Anonymous Communication Over the Internet”. *ACM Journal of Computer Security (JCS)*. 10(3):213–240. September 2002. (Submitted by invitation.)
18. Brian Levine, Sanjoy Paul, and J.J. Garcia-Luna-Aceves, “Organizing Multicast Receivers Deterministically According to Packet-Loss Correlation”. *ACM Multimedia Systems Journal*. 9(1):201–210. October 2002.
19. Christophe Diot, Brian Levine, Brian Lyles, H. Kassan, and Doug Balsiefien, “Deployment Issues for the IP Multicast Service and Architecture”. *IEEE Network, Special Issue on Multicasting*. 14(1):78–88. January 2000. Editor: Sanjoy Paul. (n.b., *IEEE Network* is a highly reviewed magazine; Acceptance rate: 6/60, 10%)
20. Brian Levine and J.J. Garcia-Luna-Aceves, “A Comparison of Reliable Multicast Protocols”. *ACM Multimedia Systems Journal*, 6(5):334–348. August 1998.

## Peer-Reviewed Conference Papers, Workshop Papers, and Extended Abstracts

21. Brian Levine, Marc Liberatore, Brian Lynn, Matthew Wright, "Statistical Detection of Downloaders and Uploaders in Freenet." In *Proc. ACM Computer and Communications Security*, November 2020. (Acceptance Rate: 121/715; 17%)
22. Keen Sung, JianYi Huang, Mark Corner, Brian Levine, "Re-identification of Mobile Devices using Real-Time Bidding Advertising Networks." In *Proc. of the ACM Mobicom*, September 2020. 13 pages. (Acceptance rate: 63/384; 16%)
23. Keen Sung, Brian Levine, Mariya Zheleva, "Protecting location privacy from untrusted wireless service providers." In *Proc. of the ACM Wireless Security Conference (WiSec)*, July 2020. 12 pages (Acceptance rate: 27/104; 30%)
24. George Bissias and Brian Levine, "Bobtail: A Proof-of-Work Target that Minimizes Blockchain Mining Variance." In *Proc. of the ISOC Symposium Network and Distributed System Security (NDSS)*, February 2020. 16 pages. (Acceptance rate: 88/506; 17%)
25. Brian Neil Levine and Brian Lynn, "Tor Hidden Services Are a Failed Technology, Harming Children, Dissidents and Journalists." In *Lawfare*, Editor in Chief: Benjamin Wittes. January 17, 2020 (reviewed by editors).
26. George Bissias, David Thibodeau, and Brian Levine, "Bonded Mining: Difficulty Adjustment by Miner Commitment." In *Proc. of the International Workshop on Cryptocurrencies and Blockchain Technology (CBT)*, September 2019. 18 pages. (Acceptance rate: 10/32; 31%)
27. A. Pinar Ozisik, Brian Levine, George Bissias, Gavin Andresen, Darren Trapp, Sunny Katkuri, "Graphene: Efficient Interactive Set Reconciliation Applied to Blockchain Propagation." In *Proc. ACM SIGCOMM*, August 19, 2019. 17 pages. (Acceptance rate: 32/221, 14%)
28. George Bissias, Brian Levine, and David Thibodeau. "Using Economic Risk to Model Miner Hash Rate Allocation in Cryptocurrencies." In *Proc. of the International Workshop on Cryptocurrencies and Blockchain Technology (CBT'18)*, September 2018. 18 pages. (Acceptance rate: 7/39; 18%)
29. Mark D. Corner and Brian Levine, "MicroMobile: Leveraging Mobile Advertising for Large-Scale Experimentation." In *Proc. ACM International Conference on Mobile Systems, Applications, and Services (MobiSys)*, June 2018. 13 pages. (Acceptance rate: 37/138; 27%)
30. Mark Corner, Brian Levine, Omar Ismail, and Angela Upreti, "Advertising-based Measurement: A Platform of 7 Billion Mobile Devices." In *Proc. ACM International Conference on Mobile Computing and Networking (MobiCom)*, October 2017. 13 pages. (Acceptance Rate: 35/186; 19%)
31. George Bissias, Brian Levine, and Nikunj Kapadia, "Securing the Assets of Decentralized Applications using Financial Derivatives." In *Proc. New Security Paradigms Workshop (NSPW)*, October 2017. 16 pages. (Acceptance rate 10/25; 40%)
32. A. Pinar Ozisik, Gavin Andresen, George Bissias, Amir Houmansadr, and Brian Levine, "Graphene: A New Protocol for Block Propagation Using Set Reconciliation." In *Proc. of International Workshop on Cryptocurrencies and Blockchain Technology (ESORICS Workshop)*, September 2017. 8 pages (short paper). (Acceptance rate: 10/27; 37%) Full paper: Technical Report UM-CS-2016-006, University of Massachusetts, Amherst, MA, October 2016.
33. Brian Levine, Marc Liberatore, Brian Lynn, Matthew Wright, "Statistical Detection of Downloaders in Freenet." In *Proc. International Workshop on Privacy Engineering*, co-located with 38th IEEE Symposium on Security and Privacy. May 25, 2017. (Acceptance Rate: 8/26; 31%)
34. Robert J. Walls, Yuriy Brun, Marc Liberatore, and Brian Levine, "Discovering Specification Violations in Networked Software Systems." In *Proc. IEEE International Symposium on Software Reliability Engineering (ISSRE)*, November 2015. (Acceptance Rate: 55/172; 32%)
35. George Bissias, A. Pinar Ozisik, Brian Levine, and Marc Liberatore. "Sybil-Resistant Mixing for Bitcoin." In *Proc. ACM Workshop on Privacy in the Electronic Society (WPES)*, November 2014. 10 pages. (Acceptance Rate: 17/67; 25%)
36. Saksham Varma, Robert J. Walls, Brian Lynn, and Brian Levine, "Efficient Smart Phone Forensics Based on Relevance Feedback." In *Proc. ACM Workshop on Security and Privacy in Smartphones and Mobile Devices*, 12 pages. November 2014. (Acceptance Rate: 11/29; 38%)
37. Keen Sung, Brian Levine, and Marc Liberatore, "Location privacy without carrier cooperation." In *Proc. IEEE Workshop on Mobile System Technologies (MoST)*, 10 pages. May 2014. (Acceptance rate: 11/30; 37%).
38. Hamed Soroush, Keen Sung, Erik Learned-Miller, Brian Levine, and Marc Liberatore. "Turning off GPS is Not Enough: Cellular location leaks over the Internet." In *Proc. Privacy Enhancing Technologies Symposium (PETS)*, pp. 103–122, July 2013. (Acceptance rate: 13/69; 19%)
39. Ryan Hurley, Swagatika Prusty, Hamed Soroush, Robert J. Walls, Jeannie Albrecht, Emmanuel Cecchet, Brian Levine, Marc Liberatore, Brian Lynn, and Janis Wolak, "Measurement and Analysis of Child Pornography Trafficking on P2P Networks." *Runner-Up, Best Paper Award*. In *Proc. Intl. World Wide Web Conference (WWW)*, 11 pages, May 2013. (Acceptance rate: 122/831; 15%)



40. Sookhyun Yang, Jim Kurose, and Brian Levine, "Disambiguation of Residential Wired and Wireless Access in a Forensic Setting." In *Proc. IEEE INFOCOM Mini-Conference*, April 2013. 5 pages. (Acceptance rate: 129/1613 in mini-conference, with 274/1613 in main conference; 25%)
41. Robert J. Walls, Shane S. Clark, and Brian Levine. "Functional Privacy or Why Cookies are Better with Milk." In *Proc. USENIX Workshop on Hot Topics in Security*, August 2012. 6 pages. (Acceptance rate: 11/39; 28%)
42. James W. Partan, Jim Kurose, Brian Levine, and James Preisig. "Low Spreading Loss in Underwater Acoustic Networks Reduces RTS/CTS Effectiveness." In *Proc. ACM International Workshop on UnderWater Networks (WUWNet)*, December 2011. 8 pages. (Acceptance rate: 19/24; 79%)
43. H. Soroush, P. Gilbert, N. Banerjee, B. N. Levine, M. Corner, and L. Cox. "Concurrent Wi-Fi for Mobile Users: Analysis and Measurements." In *Proc. ACM International Conference on emerging Networking EXperiments and Technologies (CoNEXT)*, 12 pages, December 2011. (Acceptance rate: 30/159; 19%)
44. Hamed Soroush, Nilanjan Banerjee, Mark Corner, Brian Levine, and Brian Lynn. "A retrospective look at the UMass DOME mobile testbed" *ACM SigMobile Mobile Computing and Communications Review (MC2R)*, 15(4):2–15, October 2011. (Invited paper)
45. Swagatika Prusty, Brian Levine, and Marc Liberatore. "Forensic Investigation of the OneSwarm Anonymous Filesharing System." In *Proc. ACM Conference on Computer & Communications Security (CCS)*, 13 pages, October 2011. (Acceptance Rate: 60/429; 14%)
46. Robert J. Walls, Brian Levine, Marc Liberatore, and Clay Shields. "Effective Digital Forensics Research is Investigator-Centric." In *Proc. USENIX Workshop on Hot Topics in Security (HotSec)*, August 2011. 7 pages. (Acceptance rate: 11/56; 20%).
47. Robert J. Walls, Erik Learned-Miller, and Brian Levine. "Forensic Triage for Mobile Phones with DEC0DE." *USENIX Security*, August 2011. 14 pages. (Acceptance rate: 35/204; 17%)
48. George Bissias, Brian Levine, and Ramesh Sitaraman. "Assessing the Vulnerability of Replicated Network Services." In *Proc. ACM Conference on emerging Networking EXperiments and Technologies (CoNEXT)*, 12 pages, November 2010. (Acceptance rate: 28/147; 19%)
49. Marc Liberatore, Brian Levine, and Clay Shields. "Strengthening Forensic Investigations of Child Pornography on P2P Networks." In *Proc. ACM Conference on Future Networking Technologies (CoNEXT)*, 12 pages, November 2010. (Acceptance rate: 28/147; 19%)
50. John Tuttle, Robert J. Walls, Erik Learned-Miller, and Brian Levine, "Reverse Engineering for Mobile Systems Forensics with Ares." In *Proc. ACM Workshop on Insider Threats*, 8 pages, October 2010. (Acceptance rate: 7/12; 58%)
51. Marc Liberatore, Robert Erdely, Thomas Kerle, Brian Levine, and Clay Shields. "Forensic Investigation of Peer-to-Peer File Sharing Networks." In *Proc. DFRWS Annual Digital Forensics Research Conference*, 11 pages August 2010. (Acceptance rate: 16/39; 41%)
52. Brian Levine and Marc Liberatore, "DEX: Digital Evidence Exchange for Reproducibility, Comparison, and Reliability." In *Proc. of DFRWS Annual Conference on Digital Forensics*, August 2009. 9 pages. (Acceptance rate: 15/40; 38%)
53. Hamed Soroush, Nilanjan Banerjee, Aruna Balasubramanian, Mark D. Corner, Brian Levine, and Brian Lynn, "DOME: A Diverse Outdoor Mobile Testbed." In *Proc. ACM Intl. Workshop on Hot Topics of Planet-Scale Mobility Measurements (HotPlanet)*, 6 pages. June 2009. (Acceptance rate: 5/13; 38%)
54. Brian Levine and Jerome Miklau, "Auditing and Forensic Analysis." In M. Tamer A-Zsu and Ling Liu, editors, *Encyclopedia of Database Systems*. Springer-Verlag, June 2009. 6 pages.
55. Aruna Balasubramanian, Brian Levine, and Arun Venkataramani, "Enabling Interactive Web Applications in Hybrid Networks." In *Proc. ACM MobiCom*, pp. 70–80. September 2008. (Acceptance rate: 31/264; 12%)
56. Nilanjan Banerjee, Mark D. Corner, Don Towsley, and Brian Levine. "Relays, Base Stations, and Meshes: Enhancing Mobile Networks with Infrastructure." In *Proc. of ACM MobiCom*, pp. 81–91. September 2008. (Acceptance rate: 31/264; 12%)
57. Aruna Balasubramanian, Ratul Mahajan, Arun Venkataramani, Brian Levine, John Zahorjan, "Interactive WiFi Connectivity for Moving Vehicles." In *Proc. ACM SIGCOMM*, pp. 427–438. August 2008. (Acceptance rate: 36/288; 13%)
58. N. Boris Margolin and Brian Levine "Quantifying Resistance to the Sybil Attack." In *Proc. Financial Cryptography and Data Security (FC)*, pp. 1–15. January 2008. (Acceptance rate: 26/89; 30%)
59. John Burgess, George Bissias, Mark D. Corner, and Brian Levine, "Surviving Attacks on Disruption-Tolerant Networks without Authentication." In *Proc. of The ACM International Symposium on Mobile Ad hoc Networking and Computing (MobiHoc)*, pp. 61–70. September 2007. (Acceptance rate: 27/146; 19%)
60. Xiaolan Zhang, Jim Kurose, Brian Levine, Don Towsley, and Honggang Zhang, "Study of a Bus-Based Disruption Tolerant Network: Mobility Modeling and Impact on Routing." In *Proc. ACM Annual International Conference on Mobile Computing and Networking (MobiCom)*, pp. 195–206. September 2007. (Acceptance rate: 26/233; 11%)

61. Aruna Balasubramanian, Yun Zhou, W. Bruce Croft, Brian Levine, and Arun Venkataramani, "Web Search on a Bus." In *Proc. ACM Workshop on Challenged Networks (CHANTS)*, pp. 59–66. September 2007. (Acceptance rate: 11/29; 38%)
62. Aruna Balasubramanian, Brian Levine, and Arun Venkataramani, "DTN Routing as a Resource Allocation Problem". In *Proc. ACM SIGCOMM*, pp. 373–384. August 2007. (Acceptance rate: 35/258; 14%)
63. Patrick Stahlberg, Gerome Miklau, and Brian Levine, "Threats to Privacy in the Forensic Analysis of Database Systems". In *Proc. ACM Intl Conf. on Management of Data (SIGMOD)*, pp. 91–102. June 2007. (Acceptance rate: 69/480; 14%)
64. George Bissias, Brian Levine, "Bounding Damage From Link Destruction with Application to the Internet." in *Proc. ACM SIGMETRICS*, pp. 367–368. June 2007. (Acceptance rate: 48/170, 28%; i.e., 170 submissions, of which 29 were accepted as full papers, 17 were accepted as extended abstracts.)
65. Nilanjan Banerjee, Mark D. Corner, and Brian Levine, "An Energy-Efficient Architecture for DTN Throwboxes." In *Proc. IEEE Infocom*, pp. 776–784. May 2007. (Acceptance rate: 252/1400; 18%)
66. N. Boris Margolin and Brian Levine, "Informant: Detecting Sybils Using Incentives." In *Proc. Financial Cryptography (FC)*, pp. 192–207. February 2007 (Acceptance rate: 17/100; 17%).
67. Gerome Miklau, Patrick Stahlberg, and Brian Levine, "Securing History: Privacy and Accountability in Database Systems". In *Proc. Biennial ACM/VLDB Conference on Innovative Data Systems Research (CIDR)*, pp. 387–396. Jan 2007 (Acceptance rate: 35/80; 44%)
68. Marc Liberatore, Brian Levine, Chadi Barakat, "Maximizing Transfer Opportunities in Bluetooth DTNs." In *Proc. ACM Conference on Future Networking Technologies (CoNext)*, 11 pages. December 2006. (Acceptance rate: 19/86; 22%)
69. Marc Liberatore and Brian Levine. "Inferring the Source of Encrypted HTTP Connections." In *Proc. ACM conference on Computer and Communications Security (CCS)*, pp. 255–263. October 2006. (Acceptance rate: 38/256; 15%)
70. Wenrui Zhao, Yang Chen, Mostafa Ammar, Mark D. Corner, Brian Levine, and Ellen Zegura. "Capacity Enhancement using Throwboxes in DTNs". In *Proc. IEEE Intl Conf on Mobile Ad hoc and Sensor Systems (MASS)*, pp. 31–40. October 2006. (Acceptance rate: 49/197; 25%)
71. Jim Partan, Jim Kurose, and Brian Levine. "A Survey of Practical Issues in Underwater Networks." In *Proc. ACM International Workshop on UnderWater Networks (WUWNet)*, pp. 17–24. September 2006. (Acceptance rate: 10/30; 33%)
72. Brendan Burns, Oliver Brock, Brian Levine, "Autonomous Enhancement of Disruption Tolerant Networks", In *Proc. IEEE International Conference on Robotics and Automation (ICRA)*, pp. 2105–2110. May 2006 (Acceptance rate 39%)
73. Chris Piro, Clay Shields, and Brian Levine, "Detecting the Sybil Attack in Ad hoc Networks". In *Proc. IEEE/ACM International Conference on Security and Privacy in Communication Networks (SecureComm)*, pp. 1–11. August 2006. (Acceptance rate: 32/126; 25%)
74. John Burgess, Brian Gallagher, David Jensen, Brian Levine, "MaxProp: Routing for Vehicle-Based Disruption-Tolerant Networks". *Proc. IEEE INFOCOM*, 11 pages. May 2006 (Acceptance rate: 252/1400; 18%)
75. Matt Yurkewych, Brian Levine, and Arnold Rosenberg, "On the Cost-Ineffectiveness of Redundancy in Commercial P2P Computing." In *Proc. ACM conference on Computers & Communications Security (CCS)*, pp. 280–288. November 2005. (Acceptance rate: 38/249; 15%)
76. Andrew Fast, David Jensen, Brian Levine, "Creating Social Networks to Improve Peer-to-Peer Networking." In *Proc. ACM Intl. Conf. on Knowledge Discovery and Data Mining (KDD)*, pp. 568–573. August 2005 (Short Paper) (acceptance rate: 76/465, 16%. Specifically, 465 papers submitted to KDD; of those 40 were accepted as full papers and 36 were accepted as short papers, with the remainder rejected.)
77. Aaron St. John and Brian Levine, "Supporting P2P Gaming When Players Have Heterogeneous Resources." In *Proc. ACM Workshop on Network and Operating Systems Support for Digital Audio and Video (NOSSDAV)*, pp. 1–6. June 2005. (Acceptance rate: 33/88; 38%)
78. George Bissias, Marc Liberatore, David Jensen, and Brian Levine, "Privacy Vulnerabilities in Encrypted HTTP Streams." In *Proc. Privacy Enhancing Technologies Workshop (PET)*, pp. 1–11. May 2005. (Acceptance rate: 18/71, 25%)
79. Brendan Burns, Oliver Brock, Brian Levine, "MV Routing and Capacity Building in Disruption Tolerant Networks." In *Proc. IEEE INFOCOM*, pp. 398–408. March 2005. (Acceptance rate: 244/1419, 17%)
80. N. Boris Margolin, Matthew K. Wright, Brian Levine, "Analysis of an Incentives-based Protection System." In *Proc. ACM Digital Rights Management Workshop (DRM)*, pp. 22–30. October 2004. (Acceptance rate: 10/37, 27%)
81. Haizheng Zhang, Bruce Croft, Victor Lesser, Brian Levine, "A Multi-agent Approach for Peer-to-Peer based Information Retrieval System." In *Proc. Intl. Joint Conference on Autonomous Agents and Multi Agent Systems (ICAPS)*, pp 456–464. June 2004. (Acceptance rate: 142/592, 24%)
82. Jacky Chu, Kevin Labonte, Brian Levine, "An Evaluation of Chord using Traces of Peer-to-Peer File Sharing",

- (extended abstract) in *Proc. ACM SIGMETRICS/Performance*, pp. 432–433. June 2004. (Acceptance rate: 22/252, 17%; i.e., 252 submissions, 21 full papers, 22 extended abstracts)
83. N. Boris Margolin, Matthew K. Wright, Brian Levine, “SPIES: Secrets Protection Incentives-based Escrow System.” In *Proc. Second Workshop on the Economics of Peer-to-Peer Systems (P2PEcon)*, 6 pages. June 2004. (Acceptance rate: 23/63, 37%)
  84. Brian Levine, Mike Reiter, Chenxi Wang, and Matthew Wright, “Timing Attacks in Low-Latency Mix Systems.” In *Proc. Financial Cryptography (FC)*, pp. 251–265 February 2004. (Acceptance rate: 17/78, 22%)
  85. Katrina M. Hanna, Brian Levine, and R. Manmatha, “Mobile Distributed Information Retrieval for Highly Partitioned Networks.” In *Proc. IEEE Intl. Conference on Network Protocols (ICNP)*, pp. 38–47. November 2003. (Acceptance rate: 30/230, 13%)
  86. Matthew Wright, Micah Adler, Brian Levine, and Clay Shields, “Defending Anonymous Communication Against Passive Logging Attacks.” In *Proc. IEEE Symposium on Security and Privacy*, pp. 28–41. June 2003. (Acceptance rate: 19/131, 15%)
  87. Daniel Bernstein, Zhengzhu Feng, Brian Levine, and Shlomo Zilberstein, “Adaptive Peer Selection.” In *Proc. Intl. Workshop on Peer-to-Peer Systems (IPTPS)*, pp. 237–246. February 2003. (Acceptance rate: 27/165, 16%)
  88. Kimaya Sanzgiri, Bridget Dahill, Brian Levine, Clay Shields, and Elizabeth Belding-Royer, “A Secure Routing Protocol for Ad Hoc Networks.” In *Proc. IEEE Intl. Conference on Network Protocols (ICNP)*, pp. 78–89. November 2002. (Acceptance rate: 32/217, 15%)
  89. Jacky Chu, Kevin Labonte, and Brian Levine, “Availability and Locality Measurements of Peer-to-Peer File Systems.” In *Proc. ITCOM: Scalability and Traffic Control in IP Networks II Conferences*, 12 pages. SPIE Vol. #4868. July 2002. (By invitation.)
  90. Matthew Wright, Micah Adler, Brian Levine, and Clay Shields, “An Analysis of the Degradation of Anonymous Protocols.” In *Proc. ISOC Network and Distributed System Security Symposium (NDSS)*, pp. 38–50. February 2002. *Received the Outstanding Paper Award.* (Acceptance rate: 16/79, 20%)
  91. James Davis, Andy Fagg, and Brian Levine, “Wearable Computers as Packet Transport Mechanisms in Highly Partitioned Ad hoc Networks.” In *Proc. IEEE Intl. Symposium on Wearable Computers (ISWC)*, pp. 141–148. October 2001. (Acceptance rate: 36/157, 23%)
  92. Vincent Scarlata, Brian Levine, and Clay Shields, “Responder Anonymity and Anonymous Peer-to-Peer File Sharing.” In *Proc. IEEE Intl. Conference on Network Protocols (ICNP)*, pp. 272–280. November 2001. (Acceptance rate: 36/157, 23%)
  93. Katrina M. Hanna, Nandini Natarajan, and Brian Levine, “Evaluation of a Novel Two-Step Server Selection Metric.” In *Proc. IEEE Intl. Conference on Network Protocols (ICNP)*, pp. 290–300. November 2001. (Acceptance rate: 36/157, 23%)
  94. Nathaniel E. Baughman and Brian Levine, “Cheat-Proof Payout for Centralized and Distributed Online Games.” In *Proc. IEEE INFOCOM*, pp. 104–113. April 2001. (Acceptance rate: 192/830, 23%)
  95. Clay Shields and Brian Levine, “A Protocol for Anonymous Communication Over the Internet.” In *Proc. ACM Conference on Computer and Communication Security (CCS)*, pp. 33–43. November 2000. (Acceptance rate: 28/131, 21%)
  96. Joerg Walz and Brian Levine, “A Hierarchical Multicast Monitoring Scheme.” In *Proc. Intl. Workshop on Networked Group Communication (NGC)*, pp. 105–116. November 2000. (Acceptance rate: 12/49, 25%)
  97. Brian Levine, Jon Crowcroft, Christophe Diot, J.J. Garcia-Luna Aceves, and James F. Kurose, “Consideration of Receiver Interest for IP Multicast Delivery.” In *Proc. IEEE INFOCOM*, pp. 470–479. March 2000. (Acceptance rate: 192/735, 26%)
  98. Brian Levine, Sanjoy Paul, and J.J. Garcia-Luna-Aceves, “Organizing Multicast Receivers Deterministically According to Packet-Loss Correlation.” In *Proc. ACM Intl. Multimedia Conference (Multimedia)*, pp. 201–210. September 1998. (Acceptance rate unpublished)
  99. Brian Levine and J.J. Garcia-Luna-Aceves, “Improving Internet Multicast with Routing Labels.” In *Proc. IEEE Intl. Conference on Network Protocols (ICNP)*, pp. 241–250. October 1997. (Acceptance rate: 32/81, 40%)
  100. Brian Levine, David Lavo, and J.J. Garcia-Luna-Aceves, “The Case for Concurrent Reliable Multicasting Using Shared Ack Trees.” In *Proc. ACM Intl. Multimedia Conference (Multimedia)*, pp. 365–376. November 1996. (Acceptance rate: 40/142, 28%)
  101. Brian Levine and J.J. Garcia-Luna-Aceves, “A Comparison of Known Classes of Reliable Multicast Protocols.” In *Proc. IEEE Intl. Conference on Network Protocols (ICNP)*, pp. 112–121. October 1996. (Acceptance rate: 31/96, 32%)



## **Selected Professional Service**

### **Experience as a technical expert**

- For U.S. Attorney's Office, District of Maryland. Testimony provided to the Honorable Paula Xinis, October 8 and December 2, 2021. US v. Pobre (PX-19-348). Qualified as an expert in "digital forensics".
- For U.S. Attorney's Office, Southern District of Florida. Testimony provided to the Honorable Bruce E. Reinhart, December 9, 2019. US v. Sigouin (19-cr-80136-RLR). Qualified as an expert.
- For U.S. Attorney's Office, Eastern District of Pennsylvania. Testimony provided to the Honorable Paul S. Diamon, November 22, 2019. US v. Weyerman (No. 19-88-1). Qualified as an expert in "computer science and forensics".
- For U.S. Attorney's Office, Northern District of Ohio. Expert assistance provided in US v. Rogers (No. 18-CR-26). (Listed as a witness, but I was not called.) Court of Honorable James G. Carr. May 2019.
- For U.S. Attorney's Office, District of Maryland Northern Division. Testimony provided to the Honorable J. Frederick Motz. August 30, 2017. US v. Hall, (No. JFM-16-469). Qualified an "expert in the field of peer-to-peer networking and network security".
- For U.S. Attorney's Office, Eastern District of Missouri. Testimony provided to the Honorable Nannette A. Baker. April 19, 2017. US v. Dickerman (No. 4:16-CR-258 CEJ/NAB). Qualified an expert in "networks and network security".
- For U.S. Attorney's Office, Western District of Washington. As a witness with expertise in network security, anonymous communication systems, child exploitation crimes, forensics, and more. Declaration and testimony provided to Hon. Robert J. Bryan. October 2016. US v. Tippens (No. CR16-5100 RJB), US v. Lesan (No. CR15-387 RJB), and US v. Lorente (No. CR15-274 RJB). Case 3:16-cr-05110-RJB.
- For Shaevel & Krems, LLP (Boston, MA) by Daniel O'Connor, ESQ. As an expert witness "in computer engineering and security and privacy relative to it, and computer networking" for an arbitration case (American Arbitration Association). June 2005.

### **In public service settings**

- Member of the European Commission's group on "Technical Solutions to Detect Child Sexual Abuse in End-to-end Encrypted Communications." Chaired by Antonio Labrador Jimenez. Spring 2020.
- Invited public testimony to the US Sentencing Commission hearing on "Federal Child Pornography Offenses" in Washington, DC on February 15, 2012. Chaired by Honorable Patti B. Saris (United States District Court Judge) and convened with five other commissioners present. (See <http://www.ussc.gov/amendment-process/public-hearings-and-meetings/20120215/agenda-february-15-2012>)
- Member of the Internet Safety Technical Task Force Technical Advisory Board created by joint agreement of the Attorneys General Multi-State Working Group on Social Networking and MySpace.com. June–Oct. 2008. (See <http://cyber.law.harvard.edu/research/isttf/TAB>)
- Member of the *Privacy Working Group* of the Secretary of Public Safety and Security, Massachusetts (Chairman: Secretary Kevin Burke), September 2008–2010.

### **Professional service**

- New England Security Day workshop. Founder, Steering Committee member (Sept 2015–present), Co-Organizer Sept 2015 (with others) and Co-Organizer May 2016 (with Stephen Chong and Christos Dimoulas), and Co-Organizer May 2019 (with Amir Houmansadr and Cristina Nita-Rotaru)
- Editorial Board member/Associate Editor: *IEEE Transactions on Mobile Computing* (Feb 2015–Feb 2019)
- Editorial Board member/Associate Editor: *Journal of Privacy Enhancing Technologies* (September 2014–March 2016)
- Technical Program Chair. *Annual DFRWS Digital Forensics Research Conference* 2012 (with Vice Chair Clay Shields)
- Technical Program Chair. *ACM MobiCom* 2011 (with Thyaga Nandagopal)
- Technical Program Vice Chair. *Annual DFRWS Digital Forensics Research Conference* 2011 (with Chair Florian Buchholz)
- Associate Editor. *IEEE/ACM Transactions on Networking*. From September 2005–December 2010
- Guest Editor. *IEEE Journal on Selected Areas in Communications (JSAC) special issue: Network Support for Multicast Communications*. With co-editors: D. Towsley, C. Diot, and L. Rizzo. October 2002, 20(8).
- Guest Editor. *Computer Communications (Elsevier), Special Issue: Network Security*. With co-editor: C. Shields. 2006.
- Co-founder, co-organizer ACM First Annual Northeast Digital Forensics Exchange Workshop (NeFX) 2009, 2010

- Technical Program Co-chair and Co-organizer. ACM International Workshop on Network and Operating Systems Support for Digital Audio and Video (NOSSDAV 2006) (with Mark Claypool)
- Technical Program Co-Chair and Co-Organizer. Intl. Workshop on Networked Group Communication (NGC 2002) (with Mostafa Ammar)
- Recent Technical Program Committee service (as a member): ACM SIGCOMM 2020, ACM conference on Computer and Communication Security (CCS) 2006, 2008, 2009, 2013, 2017; Digital Forensics Research Conference (DFRWS) 2009–2013, 2015; ISOC Network & Distributed System Security Symposium (NDSS) 2012, 2014; Privacy Enhancing Technologies Symposium (PETS): 2003, 2004, 2005, 2006, 2014; Annual Computer Security Applications Conference (ACSAC) 2014, 2015, 2016; Research on Attacks, Intrusions and Defenses (RAID) 2015

### Service to UMass Amherst

- **Director, UMass Cybersecurity Institute**, September 2015–present. Coordinating engagement of faculty with industry partners and government, the creation of new educational programs and degrees, and hiring of new faculty in security, from the College of Information and Computer Sciences across to many other departments and colleges at UMass.
- **Undergraduate Program Director, Honors Program Director**, September 2009–June 2012. Led the C.S. department's growth from a 250-student department to enrollments exceeding 500 students, while deploying a newly designed BS degree and newly created BA degree.
- **Principal**, Center for Academic Excellence in Information Assurance Education & Research (CAEIAE-R). One of many Centers accredited through an application to the U.S. National Security Agency. From 2003–2015, when we elected to leave the program.
- **UMass School of Computer Science Committee work**: *Promotion & Tenure (F21–S22; F19–S20 co-chair; F14–S16 co-chair), DLS chair (F18–S19), Annual Faculty Review co-chair (F07–S08), Executive Committee (F18–S19, F07–S08), Awards (F16–S17), Faculty Recruiting (F13–S16, F00–S04), Awards chair (F08), Diversity chair (S07–S08), Undergrad Program (F06, F03–S04), College Dean Search (F16), Personnel (F06–S07), ad hoc Space Planning (s04), Space (F04–S05), Graduate Program (F99–S09, F01–S03, F04–S05), Chair Search (F00), Graduate Admissions (F99–S00).*

### Teaching Experience

#### University of Massachusetts, Amherst, MA

Courses I have created and taught:

- CS 365: *Digital Forensics* (Spring 2022, Spring 2015, Spring 2010, Fall 2010, Fall 2008, Fall 2007) and CS491cc: *Advanced Digital Forensics* (Spring 2008)
- CS 461/661 *Secure Distributed Systems* (Spring 2019, Spring 2018, Spring 2017, Spring 2016) (previously numbered 490P and 690P)
- CS 391L *Computer Crime Law* (Fall 2015, Fall 2014; Fall 2011 with Marc Liberatore; and as CS391LI/691LI: *Legal Issues in Computing* in Fall 2010)
- CS660: *Advanced Information Assurance* (Spring 2005; with Kevin Fu in Fall 2006)
- CS491Q/691Q: *System Building for Mobile Devices* (with Prashant Shenoy in Spring 2003; Spring 2004, Fall 2004)
- CS460: *Introduction to Computer and Network Security* (with Jake Cunningham and Chris Misra in Spring 2001 and Spring 2002; with Chris Misra in Spring 2003, Spring 2004, and Fall 2004)
- CS653 *Advanced Computer Networks* (Fall 2000 and Fall 2001; this course was offered previously, but only as extra assignments from the undergrad class and text. I completely revamped the curriculum to focus on research papers.)

Courses I have taught:

- CS187: *Data Structures* (Spring 2012)
- CS453: *Computer Networks* (Spring 2000, Fall 2009)
- Co-instructor, CE252 *Computer Networks* (graduate), Jan. 1999. (At UC Santa Cruz)
- Co-instructor, CE152 *Computer Networks* (undergraduate), Oct. 1998. (At UC Santa Cruz)

Seminars I have taught:

- CS696e *Machine Learning Applied to Child Rescue* (Spring 2020)
- CS591CF: *Security Lecture Series* (Fall 2019, Fall 2018, Fall 2016, Fall 2015)
- CS691BL: *R Programming Language* (Fall 2013)

- CS691UN: *Underwater Networking and Sensing Seminar* (with Jim Kurose and Prashant Shenoy; and partners from WHOI, UMass Lowell, and UMass Dartmouth in Spring 2008)
- CS491P and CS491O: *Outdoor Mobile Network Environment I and II* (with Mark Corner in Fall 2006 and Spring 2007, respectively)
- CS191S: *Talent Advancement Program Seminar* (with Kevin Fu in Fall 2006)
- CS591R: *Five College Information Assurance Lecture Series* (with Mark Corner in Fall 2004)
- CS791N: *Seminar: Peer-to-Peer Networking* (Fall 2001 with Jim Kurose and Don Towsley)
- CS691M: *Seminar: Multicast* (Fall 1999)

**Graduate degrees conferred as advisor/chair (and their first/current positions):**

- *Ph.D.:*
  1. Ayse Pinar Ozisik (February 2021)
  2. Keen Sung (2020), AuDeCode, Scientist
  3. Kimberly Ferguson-Walter (2019), National Security Agency (NSA), Scientist
  4. Robert Walls (2014), Worcester Polytechnic Institute (WPI), Assistant Professor (after postdoc)
  5. James Partan (2013), Woods Hole Oceanographic Institution, Researcher
  6. Hamed Soroush (2013), Univ. of Virginia, Lecturer (now elsewhere)
  7. Aruna Balasubramanian (2011), Associate Professor SUNY Stony Brook (after postdoc)
  8. George Bissias (2010), Fluent Mobile, Research Scientist (now Research Assistant Professor at UMass)
  9. Marc Liberatore (2008), Mellon Fellow/Visiting Professor, Wesleyan University (now Senior Lecturer II at UMass).
  10. Matthew Wright (2005), Assistant Professor, Univ. of Texas Arlington (now Professor at Rochester Institute of Technology)
- *Masters of Science:* Adam Rivelli (2021), Jagath Jai Kumar (2020), S. Arta Ravazi (2019), A. Pinar Ozisik (2016), Keen Sung (2015), Juston Moore (2015), Saksham Varma (2014), Jingyi Guo (2013), Ryan Hurley (2013), Swagatika Prusty (2012), John Tuttle (2010), Steve Hannum (2010), Patrick Stahlberg (2007), John Burgess (2006), Anthony Bellissimo (2005), Aaron St. John (2005), Michael Barry (2005), Allison Clayton (2005), Matthew Yurkewych (2004), N. Boris Margolin (2004), George Bissias (2004), Ping Hung-Lee (2004), Daniel LaFlamme (2004), Jacky C.-K. Chu (2003), Katrina M. Hanna (2003), Yoshiya Kinuta (2003), Bridget Dahill (2003), Kevin Labonte (2003), Marc Liberatore (2003), Nandini Natarajan (2002), Matthew Wright (2000), Nathan Baughman (1999)

**Current Graduate Research Assistants:**

- *Ph.D. students:* Brendan Henrich, Prassana Lakkur Subramanyam
- *M.S. student:* Cody Richter